

**BEFORE THE
PUBLIC SERVICE COMMISSION OF
SOUTH CAROLINA
DOCKET NO. 2019-3-E**

In the Matter of)	DIRECT TESTIMONY OF
Annual Review of Base Rates)	STEVE IMMEL FOR
for Fuel Costs for)	DUKE ENERGY CAROLINAS, LLC
Duke Energy Carolinas, LLC, Increasing)	
Residential and Non-Residential Rates)	

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Steve Immel and my business address is 526 South Church Street,
3 Charlotte, North Carolina.

4 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

5 A. I am Vice President of Carolinas Coal Generation for Duke Energy Carolinas,
6 LLC ("DE Carolinas" or the "Company") and Duke Energy Progress, LLC ("DE
7 Progress").

8 **Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL**
9 **BACKGROUND.**

10 A. I graduated from the University of Kentucky with a Bachelor of Science degree
11 in Civil Engineering and a Masters of Business Administration from Queens
12 College. My career began with Duke Energy (d/b/a Duke Power) in 1980 as an
13 Associate Design Engineer. Since that time, I have held various roles of
14 increasing responsibility in corporate facilities, investment recovery, supply chain,
15 and operations areas, including the role of Hydro Manager; Station Manager at
16 DE Carolinas' Allen Steam Station and then Marshall Steam Station. I was named
17 Vice President of Duke Energy Indiana's Midwest Regulated Operations in 2012
18 and Vice President of Outage and Project Services in 2014. I assumed my current
19 role in 2016.

20 **Q. WHAT ARE YOUR CURRENT DUTIES AS VICE PRESIDENT OF**
21 **CAROLINAS COAL GENERATION?**

22 A. In this role, I am responsible for providing event free and reliable operations of
23 the coal generation fleet, which includes six coal stations, serving North Carolina
24 and South Carolina by providing over 10,000 megawatts ("MWs") of generation

1 capacity. My responsibilities include operating and maintaining the fleet within
2 design parameters and implementing safe work practices and procedures to ensure
3 the safety of our employees.

4 **Q. HAVE YOU TESTIFIED BEFORE THIS COMMISSION IN ANY PRIOR**
5 **PROCEEDINGS?**

6 A. Yes. I testified before the Public Service Commission of South Carolina on behalf
7 of the Company in its most recent general rate case in Docket No 2018-319-E.

8 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS**
9 **PROCEEDING?**

10 A. The purpose of my testimony is to (1) describe DEC's fossil/hydro/solar
11 generation portfolio and changes made since the 2018 fuel cost recovery
12 proceeding, as well as those expected in the near term, (2) discuss the performance
13 of DEC's fossil/hydro/solar facilities during the review period of June 1, 2018
14 through May 31, 2019 (the "review period"), (3) provide information on
15 significant fossil/hydro/solar outages that occurred during the review period, and
16 (4) provide information concerning environmental compliance efforts.

17 **Q. PLEASE DESCRIBE DEC'S FOSSIL/HYDRO/SOLAR GENERATION**
18 **PORTFOLIO.**

19 A. The Company's fossil/hydro/solar generation portfolio consists of approximately
20 14,992 megawatts ("MWs") of generating capacity, made up as follows:

1	Coal-fired -	6,764 MWs
2	Steam Natural Gas -	170 MWs
3	Hydro -	3,245 MWs
4	Combustion Turbines -	2,665 MWs
5	Combined Cycle -	2,116 MWs
6	Solar -	31 MWs

7 Allen, Belews Creek, Cliffside and Marshall generating stations make up the
8 Company's coal-fired generation assets which total 13 units. These units are
9 equipped with emissions control equipment, including selective catalytic or
10 selective non-catalytic reduction ("SCR" or "SNCR") equipment for removing
11 nitrogen oxides ("NO_x"), and flue gas desulfurization ("FGD" or "scrubber")
12 equipment for removing sulfur dioxide ("SO₂").

13 The steam natural gas unit – W.S. Lee Station ("Lee") Unit 3 – is
14 considered to be a peaking unit. The Company has a total of 31 simple cycle
15 combustion turbine ("CT") units, of which 29 are considered the larger group
16 providing approximately 2,581 MWs of capacity. These 29 units are located at
17 Lincoln, Mill Creek, and Rockingham Stations, and are equipped with water
18 injection systems that reduce NO_x and/or have low NO_x burner equipment in use.
19 The Lee CT facility includes two units with a total capacity of 84 MWs equipped
20 with fast-start ability in support of DEC's Oconee Nuclear Station.

21 The 2,116 MWs, shown earlier as "combined cycle" ("CC"), represent the
22 Buck CC, Dan River CC, and W.S. Lee CC facilities. These facilities are
23 equipped with technology for emissions control including SCRs, low NO_x
24 burners, and carbon monoxide/volatile organic compounds catalysts.

1 The Company's hydro fleet includes two pumped storage facilities with
2 four units each that provide a total capacity of 2,140 MWs, along with
3 conventional hydro assets consisting of 72 units providing approximately 1,105
4 MWs of capacity.

5 The 31 MWs of solar capacity are made up of 18 roof top solar sites
6 providing 3 MWs of relative summer dependable capacity, the Mocksville solar
7 site providing 5 MWs of relative summer dependable capacity, the Monroe solar
8 site providing 21 MWs of relative summer dependable capacity and the Woodleaf
9 solar site providing 2 MWs of relative summer dependable capacity.

10 **Q. WHAT CAPACITY CHANGES HAVE OCCURRED WITHIN THE**
11 **FLEET SINCE THE LAST FUEL CASE?**

12 A. DEC retired hydro units 5 and 6 at Ninety-Nine Islands. Cliffside Station was
13 upgraded to allow for co-fired operation, allowing utilization of coal and natural
14 gas. DEC completed the Woodleaf solar facility in December 2018. This facility
15 has 6 MWs of nameplate capacity, which provides 2 MWs of relative summer
16 dependable capacity.

17 **Q. WHAT ARE DEC'S OBJECTIVES IN THE OPERATION OF ITS**
18 **FOSSIL/HYDRO/SOLAR FACILITIES?**

19 A. The primary objective of DEC's fossil/hydro/solar generation department is to
20 provide safe, reliable, and cost-effective electricity to DEC's customers.
21 Operations personnel and other station employees are well-trained and execute
22 their responsibilities to the highest standards in accordance with procedures,
23 guidelines, and a standard operating model. Like safety, environmental
24 compliance is a "first principle" and DEC works very hard to achieve high level

1 results.

2 The Company complies with all applicable environmental regulations and
3 maintains station equipment and systems in a cost-effective manner to ensure
4 reliability for customers. The Company also acts in a timely manner to implement
5 work plans and projects that enhance the safety and performance of systems,
6 equipment, and personnel, consistent with providing low-cost power options for
7 DEC's customers. Equipment inspection and maintenance outages are generally
8 scheduled during the spring and fall months when customer demand is reduced
9 due to milder temperatures. These outages are well-planned and executed to
10 prepare the unit for reliable operation until the next planned outage to maximize
11 value for customers.

12 **Q. WHAT IS HEAT RATE?**

13 A. Heat rate is a measure of the amount of thermal energy needed to generate a given
14 amount of electric energy and is expressed as British thermal units ("Btu") per
15 kilowatt-hour ("kWh"). A low heat rate indicates an efficient fleet that uses less
16 heat energy from fuel to generate electrical energy.

17 **Q. WHAT HAS BEEN THE HEAT RATE OF DEC'S COAL UNITS DURING**
18 **THE REVIEW PERIOD?**

19 A. Over the review period, the average heat rate for DEC's coal fleet was 9,621
20 Btu/kWh. DEC's Rogers Energy Complex ("Cliffside"), Belews Creek Steam
21 Station ("Belews Creek"), Marshall Steam Station ("Marshall"), and Allen Steam
22 Station ("Allen") coal-fired generating stations have heat rates of 9,573 Btu/kWh,
23 9,489 Btu/kWh, 9,664 Btu/kWh, and 11,451 Btu/kWh, respectively. For the
24 review period, the Belews Creek units provided 36 percent of coal-fired

1 generation for DEC, with the Marshall units providing 35 percent, Cliffside units
2 providing 26 percent, and Allen units providing 2 percent.

3 **Q. HOW MUCH GENERATION DID EACH TYPE OF**
4 **FOSSIL/HYDRO/SOLAR GENERATING FACILITY PROVIDE FOR**
5 **THE REVIEW PERIOD AND HOW DOES DEC UTILIZE EACH TYPE**
6 **OF GENERATING FACILITY TO SERVE CUSTOMERS?**

7 A. The Company's system generation totaled 100,121,455 MW hours ("MWhs") for
8 the review period. The fossil/hydro/solar fleet provided 39,709,983 MWhs, or
9 approximately 40 percent of the total generation. The breakdown includes a 19
10 percent contribution from the coal-fired stations, approximately 15 percent from
11 CC operations, 2 percent contribution for the CTs, 2 percent from the hydro
12 facilities, 0.1 percent from the solar facilities, and approximately 1 percent from
13 the steam natural gas facility, Lee Unit 3.

14 The Company's portfolio includes a diverse mix of units that, along with
15 additional nuclear capacity, allow DEC to meet the dynamics of customer load
16 requirements in a logical and cost-effective manner. Additionally, DEC has
17 utilized the Joint Dispatch Agreement ("JDA"), which allows generating
18 resources for DEC and DEP to be dispatched as a single system to enhance
19 dispatching the lowest cost resources available. The cost and operational
20 characteristics of each unit generally determine the type of customer load situation
21 (e.g., base and peak load requirements) that a unit would be called upon, or
22 dispatched, to support.

1 **Q. HOW DID DEC COST EFFECTIVELY DISPATCH THE DIVERSE MIX**
2 **OF GENERATING UNITS DURING THE REVIEW PERIOD?**

3 A. The Company, like other utilities across the U.S., has experienced a change in the
4 dispatch order for each type of generating facility due to favorable economics
5 resulting from the low pricing of natural gas. Further, the addition of new CC
6 units within the Carolinas' portfolio in recent years has provided DEC with
7 additional natural gas resources that feature state-of-the-art technology for
8 increased efficiency and significantly reduced emissions. These factors promote
9 the use of natural gas and provide real benefits in cost of fuel and reduced
10 emissions for customers.

11 **Q. PLEASE DISCUSS THE OPERATIONAL RESULTS FOR DEC'S**
12 **FOSSIL/HYDRO/SOLAR FLEET DURING THE REVIEW PERIOD.**

13 A. The Company's generating units operated efficiently and reliably during the
14 review period. Several key measures are used to evaluate the operational
15 performance depending on the generator type: (1) equivalent availability factor
16 ("EAF"), which refers to the percent of a given time period a facility was available
17 to operate at full power, if needed (EAF is not affected by the manner in which
18 the unit is dispatched or by the system demands; it is impacted, however, by
19 planned and unplanned (*i.e.*, forced) outage time); (2) net capacity factor ("NCF"),
20 which measures the generation that a facility actually produces against the amount
21 of generation that theoretically could be produced in a given time period, based
22 upon its maximum dependable capacity (NCF *is* affected by the dispatch of the
23 unit to serve customer needs); (3) equivalent forced outage rate ("EFOR"), which
24 represents the percentage of unit failure (unplanned outage hours and equivalent

unplanned derated¹ hours); a low EFOR represents fewer unplanned outage and derated hours, which equates to a higher reliability measure; and, (4) starting reliability (“SR”), which represents the percentage of successful starts.

The following chart provides operational results categorized by generator type, as well as results from the most recently published North American Electric Reliability Council (“NERC”) Generating Unit Statistical Brochure (“NERC Brochure”) representing the period 2013 through 2017. The NERC data reported for the coal-fired units represents an average of comparable units based on capacity rating. The data in the chart reflects DEC results compared to NERC five-year comparisons.

Generator Type	Measure	Review Period	2013-2017	Nbr of Units
		DEC Operational Results	NERC Average	
Coal-Fired Test Period	EAF	76.4%	78.4%	752
	NCF	34.3%	56.4%	
	EFOR	8.8%	8.7%	
Coal-Fired Summer Peak	EAF	95.8%	n/a	n/a
Total CC Average	EAF	81.9%	85.0%	338
	NCF	74.7%	52.7%	
	EFOR	2.8%	5.3%	
Total CT Average	EAF	82.1%	87.8%	776
	SR	100.0%	98.1%	
Hydro	EAF	85.5%	80.4%	1,113

Q. PLEASE DISCUSS SIGNIFICANT OUTAGES OCCURRING AT DEC’S FOSSIL/HYDRO/SOLAR FACILITIES DURING THE REVIEW PERIOD.

A. In general, planned maintenance outages for all fossil and larger hydro units are scheduled for the spring and fall to maximize unit availability during periods of

¹ Derated hours are hours the unit operation was less than full capacity.

1 peak demand. Most of these units had at least one small planned outage during
2 this review period to inspect and maintain plant equipment.

3 In Fall 2018, Belews Creek Unit 2 performed a boiler outage. The primary
4 purpose of the outage was to replace the secondary superheater in the boiler and
5 rewind the LP generator. Marshall Unit 2 completed an outage in Fall 2018. The
6 primary purpose of this outage was to replace the HP and LP turbine rotors.
7 Cliffside Unit 5 and Unit 6 completed an outage for the dual fuel conversion to
8 allow the units to burn coal and natural gas. Lincoln CT Units 3-8 completed an
9 outage in Fall 2018 to upgrade the turbine control systems.

10 Allen Station Unit 3 and 4 completed an outage in Spring 2019. The
11 primary purpose for this outage was to inspect absorber spray nozzles and walls.
12 Marshall Unit 2 completed an outage in the Spring 2019. The primary purpose of
13 this outage was to conduct stack repairs and install fly ash piping replacement.
14 Marshall Unit 3 completed an outage in the Spring 2019. The primary purpose of
15 this outage was to perform air preheater maintenance. Marshall Unit 4 completed
16 an outage in the Spring 2019. The primary purpose of this outage was to conduct
17 boiler inspections and stack inspections. W. S. Lee CC completed an outage in
18 Spring 2019. The primary purpose of the outage was to perform inspections and
19 balance of plant maintenance. Buck CC completed an outage in Spring 2019. The
20 primary purpose of the outage was to perform a hot gas path inspection on the gas
21 turbines. Lincoln CT Units 11-16 completed an outage in Spring 2019 to upgrade
22 the turbine control systems.

23 **Q. HOW DOES DEC ENSURE EMISSIONS REDUCTIONS FOR**

1 **ENVIRONMENTAL COMPLIANCE?**

2 A. The Company has installed pollution control equipment to meet various current
3 federal, state, and local reduction requirements for NO_x and SO₂ emissions. The
4 SCR technology that DEC currently operates on the coal-fired units uses ammonia
5 or urea for NO_x removal. The SNCR technology employed at Allen station and
6 Marshall Units 1, 2 and 4 injects urea into the boiler for NO_x removal. All DEC
7 coal units have wet scrubbers installed which use crushed limestone for SO₂
8 removal. Cliffside 6 has a state-of-the-art SO₂ reduction system which couples a
9 wet scrubber (e.g., limestone) and dry scrubber (e.g., quicklime). SCR equipment
10 is also an integral part of the design of the Buck and Dan River CC Stations in
11 which aqueous ammonia is introduced for NO_x removal.

12 Overall, the type and quantity of chemicals used to reduce emissions at the
13 plants varies depending on the generation output of the unit, the chemical
14 constituents in the fuel burned, and/or the level of emissions reduction
15 required. The Company is managing the impacts, favorable or unfavorable, as a
16 result of changes to the fuel mix and/or changes in coal burn due to competing
17 fuels and utilization of non-traditional coals. Overall, the goal is to effectively
18 comply with emissions regulations and provide the optimal total-cost solution for
19 operation of the unit. The Company will continue to leverage new technologies
20 and chemicals to meet both present and future state and federal emission
21 requirements including the Mercury and Air Toxics Standards (“MATS”) rule.
22 MATS chemicals that DEC uses when required to reduce emissions include, but
23 may not be limited to, activated carbon, mercury oxidation chemicals, and
24 mercury re-emission prevention chemicals. Company witness McGee provides

1 the cost information for DEC's chemical use and forecast.

2 **Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?**

3 **A. Yes, it does.**